Poole Bros. Chicago

Printed in U. S. A.

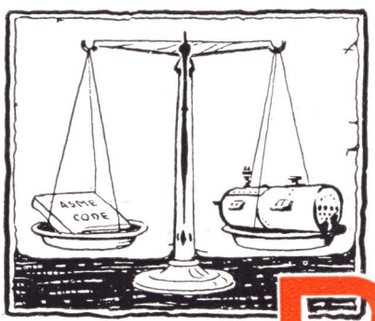
HOW TO TELL

By WICKES

REFERENCE
CATALOGUE LIBRARY
NOV 25 1940

COPYRIGHT 1923, THE WICKES BOILER CO., SAGINAW, MICH

Do They Balance?



RULES and regulations for the safe and proper use, construction, and inspection of steam boilers have been enacted by many states and municipalities. They have adopted for their rules the A.S.M.E. Boiler Code which clearly specifies a standard for materials and boiler construction. The organization of the National Board of Boiler and Pressure-Vessel Inspectors insures measures being taken for rigid, intelligent, uniform enforcement of the Code and promises a new era in the prevention of accidents in the use of steam boilers.

On the following page, editorials taken from the paper "POWER" make plain and clear that rigid shop inspection during construction is necessary.

The scales balance when—the boiler meets the letter of the Code requirements—and *no more.*

The pointer swings to the purchaser's favor when—the boiler is built in the *spirit* as well as the letter of the Code.

Do you want a *heaping measure?*

This folder presents facts you should know concerning boiler shop operations and workmanship entering the construction of Horizontal Tubular Boilers.

It will enable you to know what today is the highest standard of the boilermaking art.

It will enable you to choose intelligently.

Presented by

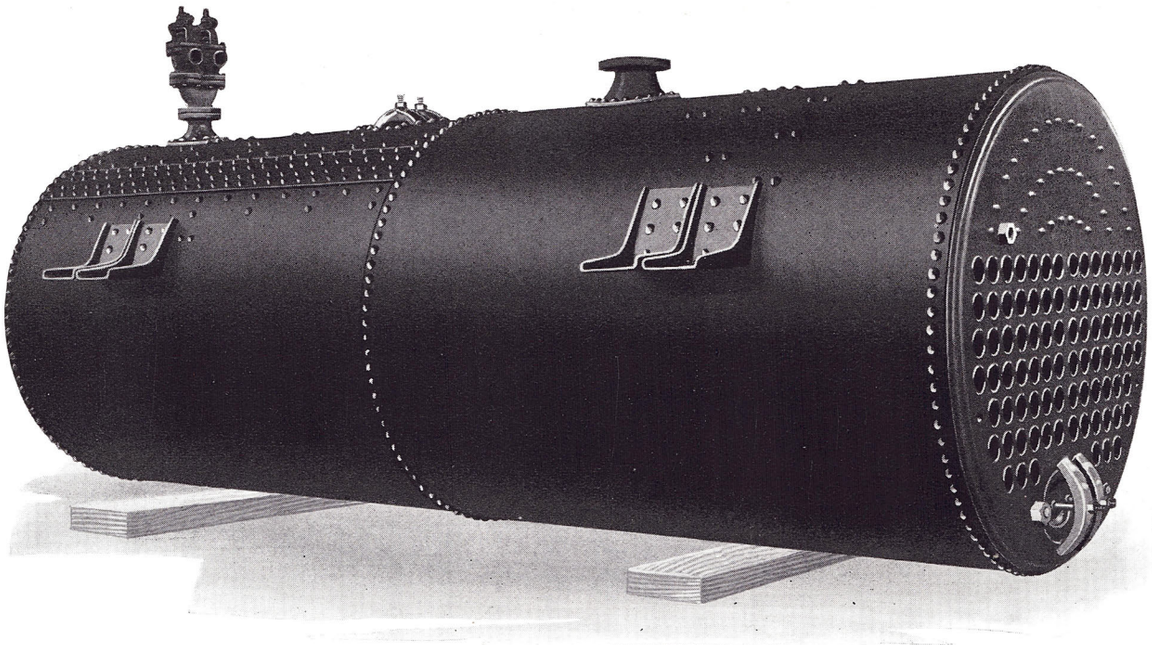
The Wickes Boiler Co.

Saginaw, Mich., U. S. A.

Manufacturers of high-grade Horizontal Tubular Boilers

Sales Offices:

New York City, 501 Fifth Ave. Pittsburgh, 1218 Empire Bldg. Seattle, 736 Henry Bldg.
Detroit, 1116 Penobscot Bldg. Chicago, 76 West Monroe St.



A. S. M. E. Boiler Code Horizontal Tubular Boiler with forged steel nozzles for steam and safety valve openings and safety valve arrangement as furnished by The Wickes Boiler Co., Saginaw, Michigan, U. S. A.

Are Boilers Dangerous?

THE U. S. Government realizing the great hazard to human life by the use of steam boilers in steamboats, adopted rules and regulations governing the construction and inspection of marine boilers in 1872. These regulations have been, and are today, very rigidly enforced.

A terrible explosion on March 20, 1905, at Brockton, Mass., in which 58 were killed, 117 injured, the property loss $250,000, and the death and injury suits, $280,000, prompted Massachusetts, as the first state, to adopt a boiler law governing the construction and inspection of stationary boilers.

The Hartford Steam Boiler Inspection and Insurance Co., in "Locomotive," October 1920, stated that there is an average, including Sundays, of more than one boiler explosion per day, the number of killed and injured average over one per explosion and no estimate of the property damage was given.

There is perhaps no class of equipment in your plant subject to greater strains and stresses than boilers. Due to the enormous quantity of stored-up heat energy in steam boilers, explosions are a calamity. For this reason, the design, construction, and workmanship of boilers merit your careful consideration down to the smallest detail.

Is There a Difference in Boiler Construction?

IT IS the intent of the A.S.M.E. Boiler Code that the manufacturer will build boilers to the Code in both spirit and letter. The following paragraph is quoted from the letter of the Code Committee to the A.S.M.E. Council transmitting the 1918 Edition to them for final approval:

"The primary object of these Rules is to secure safe boilers. The interests of boiler users and manufacturers have been carefully considered and the requirements made such that they will not entail undue hardship by departing too widely from present practice."

In buying a piece of machinery what do you look for besides the fact that each part is strong enough and that it is capable of doing the work you wish? You consider the integrity of the builder. You look for finish and exactness in shop work.

To the inexperienced all boilers look fine and the workmanship good. This is perfectly natural because the cylindrical surface and the heads are smooth, and being painted with a thick coat of paint, present a pleasing appearance. The real value of a boiler, however, is found in the accuracy of the shop operations, from flanging to hydrostatic test, and the tolerances worked to, when fitting together the different parts.

For your aid in the selection of the best boiler we have outlined on the inside of this folder—what to look for.

BOILER INSPECTION
DURING CONSTRUCTION

READ WHAT "POWER" SAYS ABOUT IT EDITORIALLY

EDITORIALS

THOSE interested in the purchase of boilers must appreciate the advantages resulting from the standards of good material, uniform design and careful construction, established by the A. S. M. E. Boiler Code. Likewise, the builder of boilers is confident a competitor cannot comply with Code requirements, and use unbranded boiler plate, full-punched holes and improperly fitting parts, in that way producing an inferior boiler that can be profitably disposed of at a lower price.

* * * * *

There seems to be no disagreement as to the broad benefits from the work done by the Code committee, but the historical verdict will depend not so much upon the aims and objects of the Boiler Code as upon its practical application. The men to whom is intrusted the examination of the design, material, construction, installation and the operation of the boiler intended to meet specifications, must not only be capable of passing sound judgment, but also must have the inclination to do so.

* * * * *

The boiler manufacturer, his engineer or superintendent who seeks to influence a conscientious inspector to depart from the dictates of his better judgment, by insisting that similar favors have been extended by other inspectors, is creating a condition of ultimate benefit to his competitors, and by reason of such favors the whole plan of uniform boiler requirements may be defeated. The acceptance of an unbranded plate or in fact the use of a plate that was rebranded by the representative of the steel maker after all identification marks had been removed, the acceptance of questionable riveting or poor workmanship of any description, breeds within the inspector the "good enough" feeling which will destroy the man's judgment and cause an unmistakable decline in the boilermaking art.

* * * * *

While the steel manufacturer or boilermaker may suffer a slight financial loss when inferior goods are rejected, the production of a good boiler should be the goal. Those directing the work of the shop inspectors should establish the Code boiler, during the tradition forming period, on such a foundation that the public will understand the meaning of the Code emblem as clearly as is now understood the daily press headline, "The Marines Have Landed."

* * *

EDITORIALS

* * * * *

But how is an inspector to know that a boiler has been constructed in accordance with the Code? This cannot be told by inspection after the boiler is finished, but involves inspection during construction.

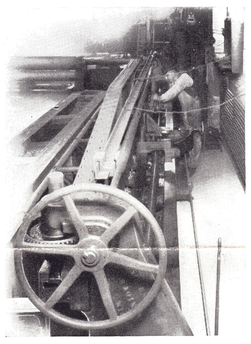
layer surfaces. The second of these tests is of greatest importance wh... tensile stre... is the main... As might...

Wickes Boilers meet the A. S. M. E. Boiler Code requirements in design, construction and workmanship, both in spirit and letter. We invite and welcome the most rigid inspection of our boilers while under construction.

What to Look For—
The Best Shop Operations

Identify the Plate

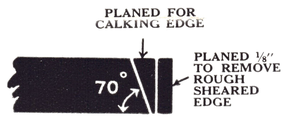
1 Examine all plates and heads to see that they are plainly stamped with the maker's name, "Fire-Box Steel" and the heat and melt numbers. Measure the size of the plates and see that at least ¼ inch has been allowed on each edge for planing.



THE PLATE PLANER

See That the Plate Is Planed

2 See that all edges are planed off not less than ⅛ inch. In addition calking edges must be planed to a bevel edge of not less than 70 degrees.



Look to the Tube Spacing

6 Examine the tube spacing by measuring the center to center dimensions of a number of tubes. This will indicate if any ligaments have been weakened by inaccuracy in laying out.

Get Die Formed Butt Straps

7 It is very important that butt straps and the ends of shell plates forming the longitudinal joints be formed in dies by a hydraulic press to the proper curvature. When plates are not properly formed in this manner and are drawn together by riveting, unnatural stresses are set up which are dangerous. The balance of the shell plates are rolled to a true circle. The meeting edges should butt evenly along the entire length of the plate.

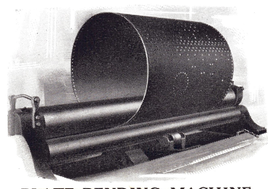
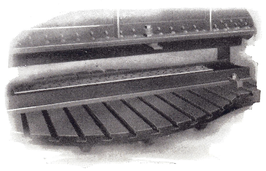


PLATE-BENDING MACHINE ROLLING BOILER SHELL



BUTT STRAP BEING FORMED IN DIE

BUTT STRAPS AND ENDS OF SHELL PLATES

See That the Rivets Are of the Proper Size

11 The rivets should be of such size and so spaced for the thickness of plate used that the efficiency for the triple riveted butt joint will be not less than 87.5%, and for the quadruple riveted joint not less than 94%. The diameter of the rivet holes should be not more than $\frac{1}{32}$ inch to $\frac{1}{16}$ inch larger than the diameter of the rivets, depending upon their diameter.

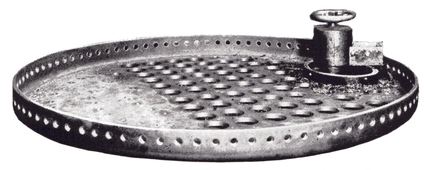
Compare Rivet Centers

12 Measure and compare the distance between the centers of the rivets in both longitudinal and circumferential seams, in a number of different places. This will be an indication of the accuracy used in the spacing of rivet holes. *Caution:* The shearing strength of the rivets in the circumferential seam must be not less than 50% of the full strength of plate.

Remove Burrs After Drilling

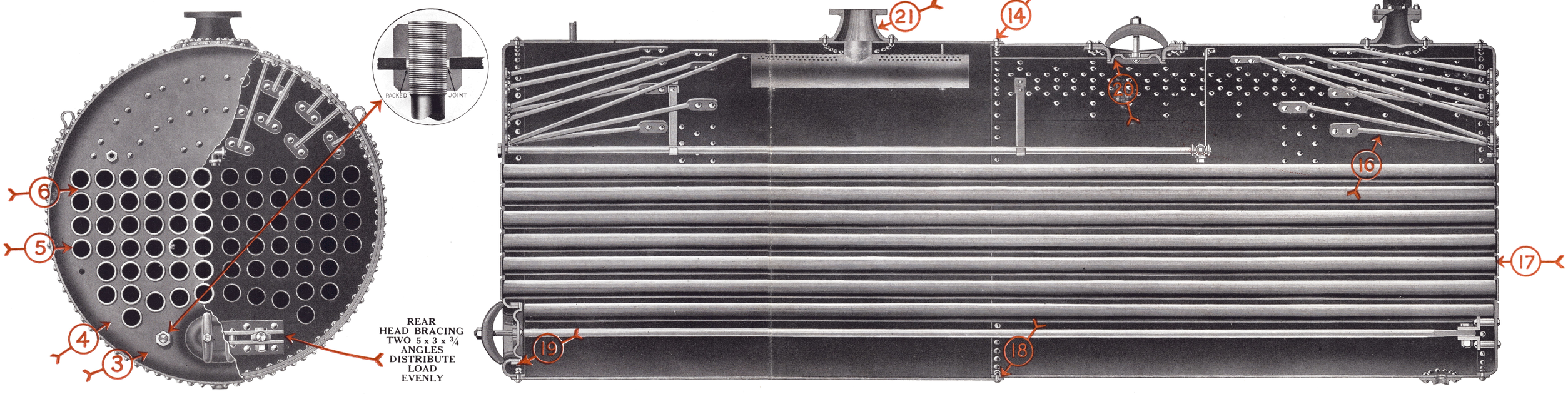
13 After drilling rivet holes the longitudinal and circumferential joints should be dismantled and the burrs and chips removed. The shell is then reassembled metal to metal with turned barrel pins and tack bolts. The rivets should be hydraulically driven at different points to prevent creeping, placing one on each side of the tack bolts before removing. The front head is riveted to the shell with a pneumatic air hammer. Rivets must be allowed to cool and shrink under pressure.

Inspect Gasket Bearing Surfaces



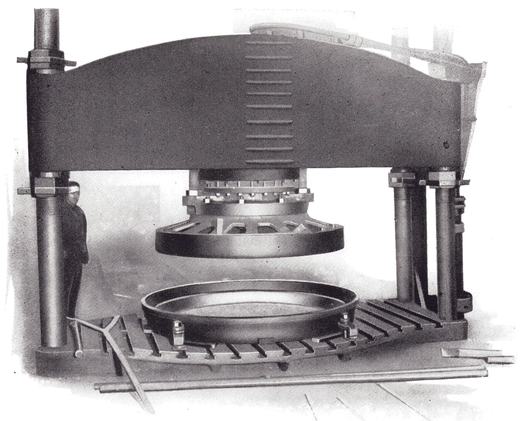
FACING SEAT FOR MANHOLE COVER

19 A faced bearing surface not less than $\frac{11}{16}$ inch wide at any point is necessary in both manhole frames for tight joints. This permits the use of a thin wide gasket which can be used over and over again without being cut or requiring replacing.



Insist on Heads Flanged Hot

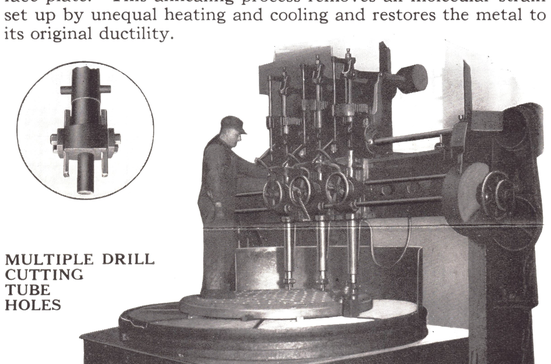
3 Require the heads to be flanged *hot* in dies by hydraulic pressure. This should be so carefully done that the difference between the circumference obtained and the true circumference is negligible. See that there are no cracks, deep hammer marks, burned sections, scars, or other injurious surface defects.



BOILER HEAD BEING FLANGED HOT IN DIE

Heads Should Be Annealed

4 After flanging, the heads should be heated to a cherry red, carefully straightened, and permitted to cool, clamped to a face plate. This annealing process removes all molecular strain set up by unequal heating and cooling and restores the metal to its original ductility.



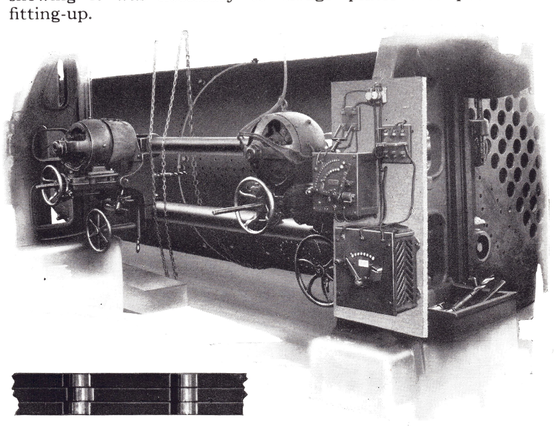
MULTIPLE DRILL CUTTING TUBE HOLES

See That the Tube Holes Are Cut from the Solid Plate

5 All tube holes should be cut from the solid plate with a rotating cutter, not more than $\frac{1}{32}$ inch larger than the tube diameter. Pilot holes for this cutter may be punched $1\frac{5}{16}$-inch diameter. Tube holes produced by this method are perfect.

Know How Your Boiler Is Fitted-Up

8 One of the most important operations in the building of a boiler is known as "Fitting-up." Butt straps and shell plates in the longitudinal joint should fit, before bolting up, so there is perfect metal to metal contact at all points. The circumference of the heads must be true to the circumference of the shell. Hammer marks on the edges of plates indicate careless workmanship, showing it was necessary to sledge plates into position in fitting-up.

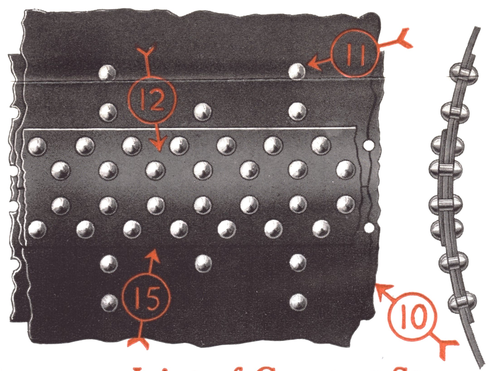


NOT FAIR RIVET HOLES — FAIR RIVET HOLES

DRILLING RIVET HOLES IN SHELL WITH GANG DRILL

Rivet Holes Should Be Drilled in Position

9 After the shell is fitted-up all rivet holes should be *drilled full size in position*. To do this, it is necessary that the centering holes be drilled in one set of plates in the flat ¼ inch small. This assures you that the rivet holes are absolutely fair through all plates.



Secure a Joint of Greatest Strength

10 In any tubular boiler 54 inches in diameter and larger the longitudinal joint should be of the triple riveted butt type for 100 lbs. working pressure. For all higher pressures they should be of the quadruple riveted butt type.

Are the Rivet Heads Uniform?

14 Examine the rivet heads. They should be button type, uniform, true, with heads accurately centered. Each rivet should contain enough metal to completely fill the hole and form a full head of the required size without fins. If irregular or lopsided, it is logical to deduce they were hurriedly or carelessly driven. Look particularly for blind rivets put in to plug holes carelessly placed out of line. Look for burned rivets.

Examine for Bulging

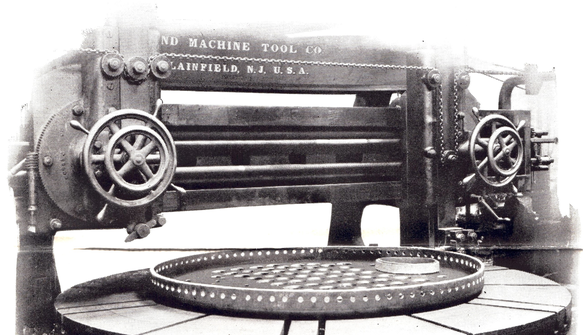
15 Examine the plate between the rivet holes for bulging. This would indicate excessive calking or too great a rivet pitch.

Do the Diagonal Braces Fit?

16 Examine the diagonal braces. They should be of weldless steel forged from one piece with full strength in the foot. The braces should be straight and fitted hot at both ends.

Tube Ends Should Be Carefully Finished

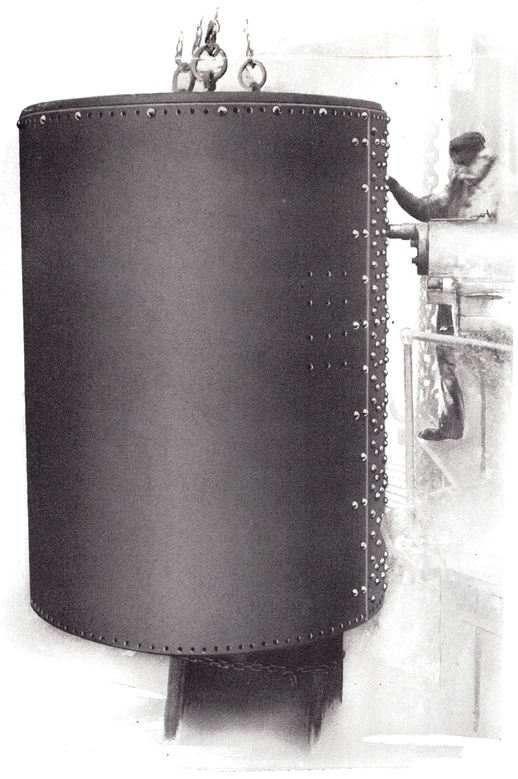
17 Tubes should be carefully rolled with a Dudgeon expander. They should be closely beaded to the heads and the beading should be full, smooth and free from cracks.



FACING EDGE OF FLANGE IN BORING MILL

Look at the Calking

18 Be sure that the calking on the outside and *inside* of the circumferential joints is carefully done without splitting or indention of the under plate. To make inside calking possible the edge of the flange on the heads is faced in a boring mill to a calking edge. Butt straps to be calked in the same manner on the outside.



HYDRAULIC RIVETER

Get Pressed Steel Manhole Covers

20 The manhole covers and crabs should be flange steel, ~~pressed in shape. Each cover should be~~ supplied with *two* 1⅛-inch collar bolts riveted in place.

Require Forged Steel Nozzles

21 Ascertain if all flanges and nozzles are made of wrought material. Examine the calking, because in calking flanges and nozzles the shell plate is often carelessly cut.

Witness the Hydrostatic Test

22 See the hydrostatic test of 1½ times the working pressure applied to the boiler after it is completed. A vent on top of the boiler should be opened to be sure all air is excluded. The test pressure should be held until a thorough inspection can be made. If any leaks develop that cannot be stopped without excessive calking or rolling, the defective part or parts should be replaced.

This card will bring you additional Wickes Service without cost or obligation

MAIL IT NOW

Products Manufactured by

THE WICKES BOILER CO.

The Wickes Vertical Water Tube Steam Boiler.
The Wickes Horizontal Cross Drum Steam Boiler.
The Wickes Marine Water Tube Steam Boiler.
The Wickes Horizontal Return Tubular Boiler.
The Wickes Open Feed Water Heater.
Steel Casings for all Types of Boilers.
Grates—Rocking, Tupper and Two-Bar.
Wickes Combined Dead-Plate and Hearth-Plate.
Stacks and Breechings.
Large Storage Tanks.